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ГЕОГРАФИЧЕСКИЕ ОСОБЕННОСТИ СТРУКТУРЫ И ПРОИЗВОДСТВА ТЕХНИЧЕСКИХ КУЛЬТУР ПО ВЫСОТНЫМ ЗОНАМ В СЕВЕРО-ЗАПАДНОЙ ЧАСТИ АЗЕРБАЙДЖАНА НА ПРИМЕРЕ ГЯНДЖА-ДАШКЕСАНСКОГО И ГАЗАХ-ТОВУЗСКОГО ЭКОНОМИЧЕСКИХ РАЙОНОВ

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Аннотация. Северо-западная часть Азербайджана признана важным центром возделывания технических культур, таких как подсолнечник, хлопок и сахарная свекла. В этом регионе за последнее десятилетие площади, выделяемые для выращивания технических культур, увеличились более чем в два раза, а производство этих культур возросло в шесть раз. На примере Гянджа-Дашкесанского и Газах-Товузского экономических районов рассматриваются структура технических культур и их распределение по высотным поясам в северо-западной части Азербайджана. Исследование проводилось с использованием региональных статистических данных и результатов анализа, выполненного в ходе обследования этой части страны. Благодаря применению такого комбинированного подхода удалось определить особенности выращивания технических культур на разных высотах и оценить урожайность этих культур. Подчеркивается, что хороших природных условий недостаточно для возделывания технических культур и необходимо использовать агротехнические приемы и инновационные подходы к выращиванию растений с учетом особенностей культуры.

Ключевые слова: экономический район; специализация сельского хозяйства; высотные пояса; структура производства технических культур; Азербайджан.

GEOGRAPHICAL FEATURES OF THE STRUCTURE AND PRODUCTION OF TECHNICAL CROPS BY ALTITUDE ZONES IN THE NORTH-WESTERN PART OF AZERBAIJAN ON THE EXAMPLE OF THE GANJA-DASHKASAN AND GAZAKH-TOVUZ ECONOMIC REGIONS

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Abstract. The north-western part of Azerbaijan is recognised as an important center for the cultivation of technical crops such as sunflower, cotton and sugar beet. In this region, over the past decade, the area allocated for the cultivation of technical crops has more than doubled, and the production of these crops has increased six fold. Using the example of the

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Ganja-Dashkasan and Gazakh-Tovuz economic regions, the structure of technical crops and their distribution by altitude zones in the north-western part of Azerbaijan are considered. The study was conducted using regional statistical data and the results of the analysis carried out during the survey of this part of the country. By applying this combined approach, it was possible to determine the characteristics of growing technical crops at different altitudes and estimate the yield of these crops. It is emphasised that good natural conditions are not enough for the cultivation of technical crops and it is necessary to use agrotechnical methods and innovative approaches to growing plants taking into account the characteristics of the crop.

Keywords: economic region; agricultural specialisation; altitude zones; structure of technical crop production; Azerbaijan.

Introduction

The production of technical crops plays a crucial role in the sustainability of the country's economy. The development of technical horticulture is essential for the growth of other related sectors as a source of raw materials for food and light industry and also has a positive impact on the employment of the population. Currently, one of the most important issues is to ensure the growing development of this horticultural sector and to increase the export potential. In this respect, the efficient territorial organisation of technical crops, their quality to meet market requirements, export opportunities and research into problems in this field are of economic and geographical importance.

Recently, continuous reforms in the agricultural sector and the implementation of state programmes had a positive impact on the development of horticulture in the regions and have increased interest in the production of technical crops. A number of measures have been taken to stimulate the cultivation of such plants. According to the Decree «On stimulation of sugar beet production in the Republic of Azerbaijan» dated 4 April 2017, subsidies in the amount of 4 manats per 1 t of sugar beet delivered were paid to sugar beet growers, legal entities engaged in sugar beet processing and natural persons engaged in entrepreneurial activities without establishing a legal entity.

At present, subsidies are paid to farmers to encourage the cultivation of technical crops. In the case of sunflower, the subsidy is 240 manats per 1 ha planted and 86 manats for replanting. The subsidy for farmers is 170 manats per 1 t of cotton delivered to the delivery points, 18 manats per 1 t of wet tobacco and 12 manats for sugar beet.

Some of the technical crops have developed rapidly in the north-western part of Azerbaijan in recent years and have become some of the region's specialist crops. In fact, this area ranks first in the country in sugar beet and sunflower production. At present, the high market demand for products from these crops and the increasing cost of imported products require continuous development in this area. The survey conducted in the north-western part of Azerbaijan showed that there are difficulties in developing these horticultural areas in the administrative districts. These problems will be studied and the necessary support will be provided to overcome them.

In addition, in 2023 Azerbaijan exported 69.4 thsd t of cotton fibre, 11.2 thsd t of cotton fabrics, 31.8 thsd t of sugar, 5.5 thsd t of vegetable oils and 3.0 thsd t of tobacco. Total earnings from the export of these products amounted to 193.5 mln US dollars. At the same time, the country imported 258.7 thsd t of raw sugar, 121.2 thsd t of vegetable oils, 7.2 thsd t of tobacco and 367.2 mln units of cigarettes, for which it spent 413.6 mln US dollars [1].

Productive areas of the Ganja-Dashkasan and Gazakh-Tovuz economic regions, agroclimatic conditions and traditional working habits of the population in agriculture have paved the way for territorial organisation and development of technical horticulture.

In the north-western part of Azerbaijan there are potential opportunities for the growth of technical crops and, that in the future, they may have a significant impact on the local demand of the region and reduce the population's dependence on imports. At present, there is a high demand for oils obtained from technical crops. The recent increase in prices on the domestic market and the weakening of the population's purchasing power require us to implement reforms aimed at increasing the production of technical crops. In this research, we have studied the current state of technical crops in the Ganja-Dashkasan and Gazakh-Tovuz economic regions and their organisation by altitude zones depending on the landscape.

Research methodology

Modern agriculture, natural-geographical and economic factors influencing its development and economic potential have been studied on the basis of sources related to the north-western part of Azerbaijan. In addition, the agricultural location by altitude zones and the current situation were studied on the basis of statistical data related to this field. In the article the works of Azerbaijan scientists and researchers [2–8] on agriculture, the

data of the State Statistics Committee of the Republic of Azerbaijan[1] [1; 9; 10] and the author's research were used as a source of information. Azerbaijani scientists are constantly studying agriculture, territorial organisation, development potential and current situation of the country. They also conduct research on technical crops and other areas of plant production.

Researches on technical crops have been conducted in many countries of the world [11–17].

This article analyses the current status of technical crops and their location by altitude zone in the north-western part of Azerbaijan. Statistical data and a survey carried out in this area were used to determine the development characteristics of technical crops.

Results and discussion

The studied economic regions of Ganja-Dashkasan and Gazakh-Tovuz with 5.0 and 4.6 % of the share of technical crops respectively rank fourth and fifth after the economic regions of Mil-Mughan (34.6 %), Karabakh (23.6 %) and Shirvan-Salyan (21.9 %).

In the Ganja-Dashkasan and Gazakh-Tovuz economic regions, the share of technical crops is 7.4 and 4.3 % of the total agricultural crop area respectively. Technical crops are mainly grown in the Samukh (24.0 %) and Goranboy (70.0 %) administrative districts of the Ganja-Dashkasan economic region, and in the Tovuz (23.5 %), Shamkir (27.8 %) and Aghstafa (47.0 %) administrative districts of the Gazakh-Tovuz economic region [9].

Technical crops are mainly spring sown crops and cereals. Technical crops such as sunflower, sugar beet, cotton and tobacco are grown in small quantities in the north-western part of Azerbaijan (fig. 1). It should be noted that in the Ganja-Dashkasan and Gazakh-Tovuz economic regions, sunflower accounts for 58.9 % of the total area under technical crops, cotton – 14.2 %, sugar beet – 16.2 % and tobacco – 0.6 % [4].

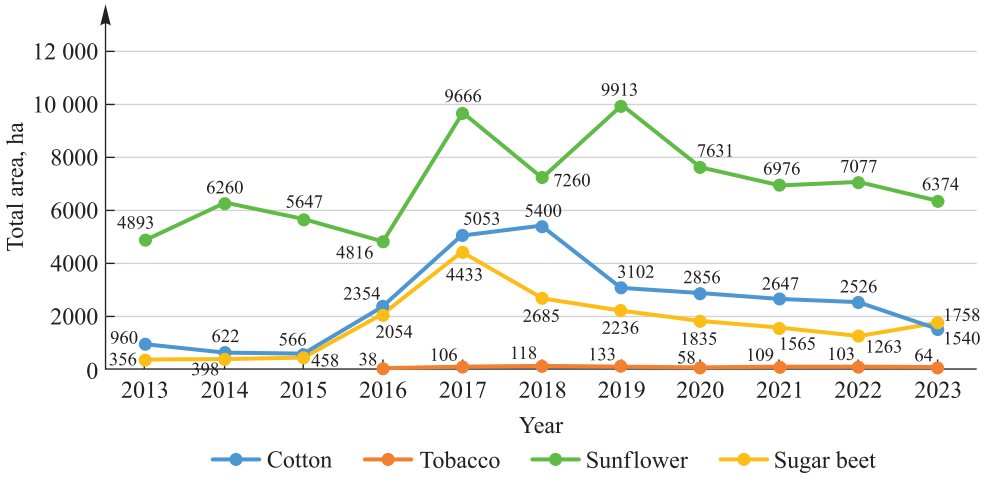

Fig. 1. The dynamics of technical crop cultivation over 10 years in the north-western part of Azerbaijan, ha.
Source: [9]

The line graph compares the changes in the four main areas in terms of the total area under technical crops in the Ganja-Dashkasan and Gazakh-Tovuz economic regions over 10 years. It can be seen that the indicators for the total area of technical crops are unstable between 2013 and 2023. All crops increase over 10 years. From 2013 to 2017 there was a sharp increase in sunflower crops. This level seems to be maintained in 2019, then the indicators for sunflower decrease slightly. Since 2013, 960 ha of cotton was slowly decreasing, then jumped roughtly, reached 5400 ha. After 2018, the indicators for cotton decreased slightly and currently cotton plants occupy 1540 ha. The indicators for sugar beet increased rapidly from 2013 to 2017, then decreased dramatically. The indicators for tobacco increased gradually over 10 years.

Tobacco cultivation started in 2016 and increased from 38 to 64 ha. Sunflower, cotton, and sugar beet are the most variable crops.

The pie charts (fig. 2) show the main changes in technical crops and production over 10 years. In 2013, a very large majority of plantations was cultivated sunflower, accounting for almost four-fifths. Cotton accounted for less than a fifth. Sugar beet accounted for about one in twenty. But in 2023, these indicators changed. Although sunflowers still account for a significant proportion of the area, just over three-fifths, sugar beet is about one-fifth and cotton is almost one-fifth.

[1]Strategic roadmap for the production and processing of agricultural products in the Republic of Azerbaijan [Electronic resource] : approv. by Decree of the President of the Repub. of Azerbaijan of 6 Dec. 2016 No. 1138 // Faolex / Food and Agriculture Organisation of the United Nations. Baku, 2016 (in Azerb.).

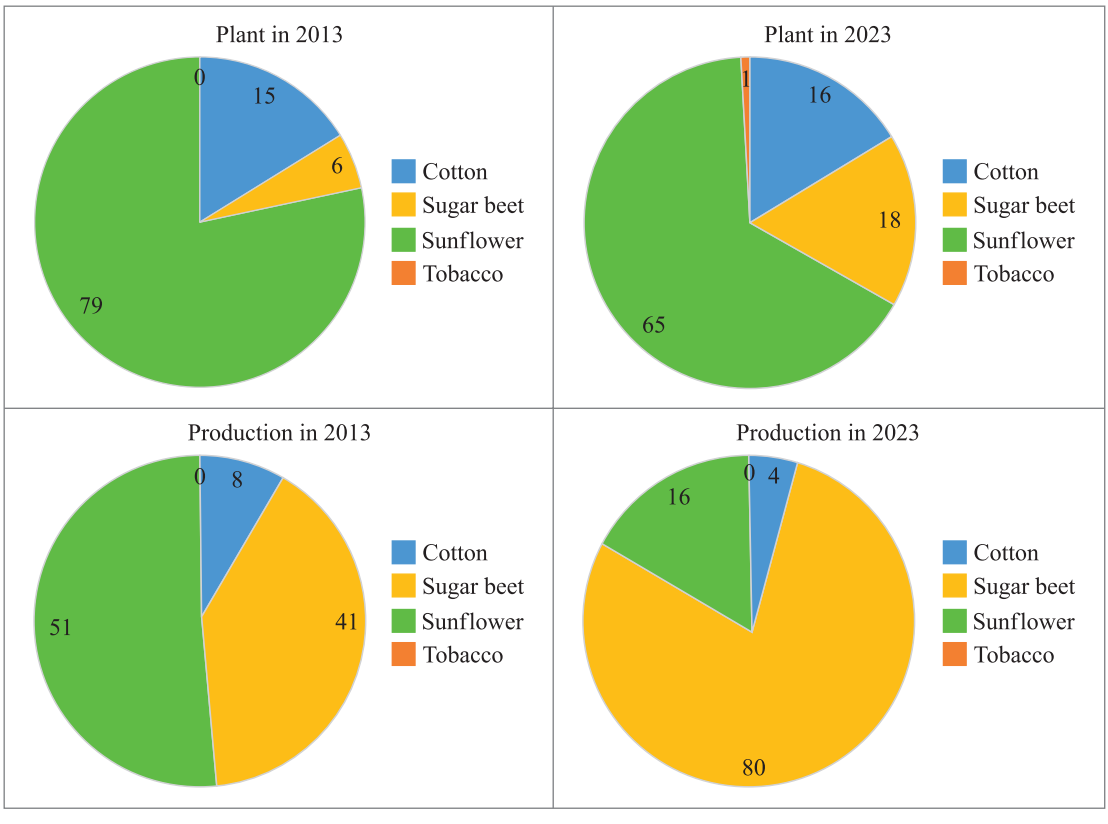

Fig. 2. Proportions of technical facilities and production in 2013 and 2023 in the north-western part of Azerbaijan, % (according to [9], modified)

Note that, the production indicators in these years are different than those for technical crops. As can be seen, in 2013, sunflower indicators production is more than half, sugar beet indicators productions is more than two-fifths and cotton indicators production is just under a tenth. But currently a very large majority part of the pie charts is sugar beet, it is four-fifths. This is due to the increased productivity of sugar beet in recent years (see fig. 2).

Cereal sunflower has recently become one of the most specialised technical crops in the north-western part of Azerbaijan. In the world agricultural system, the area under sunflower cultivation is about 14–15 mln ha. This plant is grown mainly in Argentina, Bulgaria, Georgia, Hungary, India, Kazakhstan, Moldova, Russia, Ukraine and the USA [6].

In Azerbaijan, sunflower is grown mainly in the north-western part of the country. Thus, about two-thirds of the country's sunflower area and production is located in this area.

Sunflower is one of the specialised technical crops in the economic regions. A significant proportion of sunflower (65 %) is producted in the Ganja-Dashkasan and Gazakh-Tovuz economic regions (fig. 3) [10].

The results of the study are presented below according to the share of areas occupied by technical crops.

The north-western part of Azerbaijan has favourable conditions for growing sunflower, which is an oil plant. Widespread chestnut and grey forest soils are considered fertile for sunflower cultivation.

Sunflower is a light demanding crop. Sunflower requires a temperature of 2600–2850 °C during the ripening period (100–150 days). Although it can tolerate temperatures of 8–34 °C, the optimum temperature is considered to be 20–25 °C. When sowing, the temperature should be 8–10 °C. For this reason, it is planted in April – May and harvested in September – October. Sunflower is grown after autumn wheat and maize in alternating intercrops, and after barley and spring wheat in weed-free fields.

In Ganja-Dashkasan economic region, 30.9 % of the sunflower area is located up to 200 m. This area has the highest productivity rate of about 38.1 centner/ha. Sunflower is mainly grown here under irrigated conditions. Sunflowers are not grown in this altitude zone in the Tovuz-Gazakh economic region (fig. 4 and 5, table 1).

Sunflower is grown in all districts except Dashkasan. In particular, it is grown in the districts of Shamkir (972 ha), Samukh (1319 ha), Aghstafa (1263 ha) and Goranboy (2349 ha), among which Goranboy stands out. Goranboy district accounts 53.8 % of sunflower production in the Ganja-Dashkasan economic region, and 23.7 % of the area and 24.3 % of production in the republic.

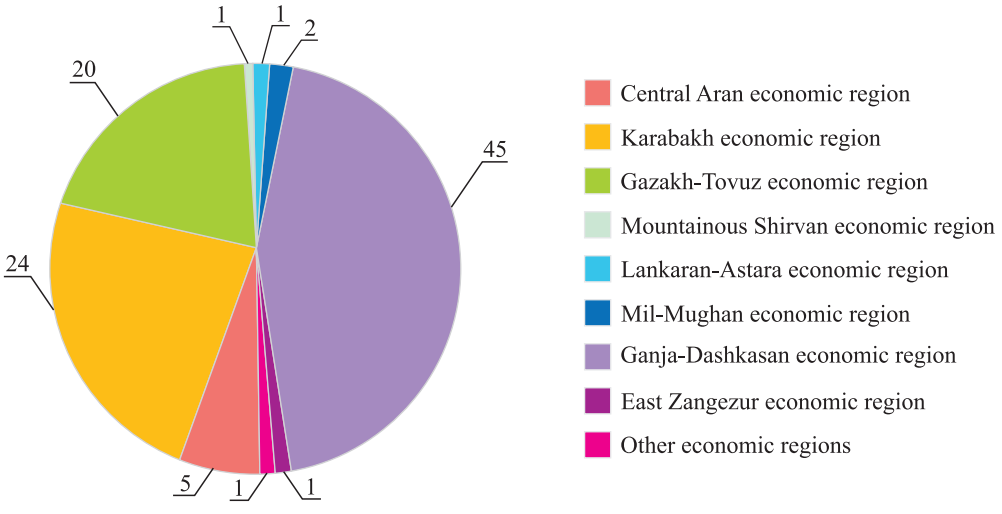

Fig. 3. Distribution of sunflower production
in the Republic of Azerbaijan in 2023 by economic regions, %
(according to [9], modified)

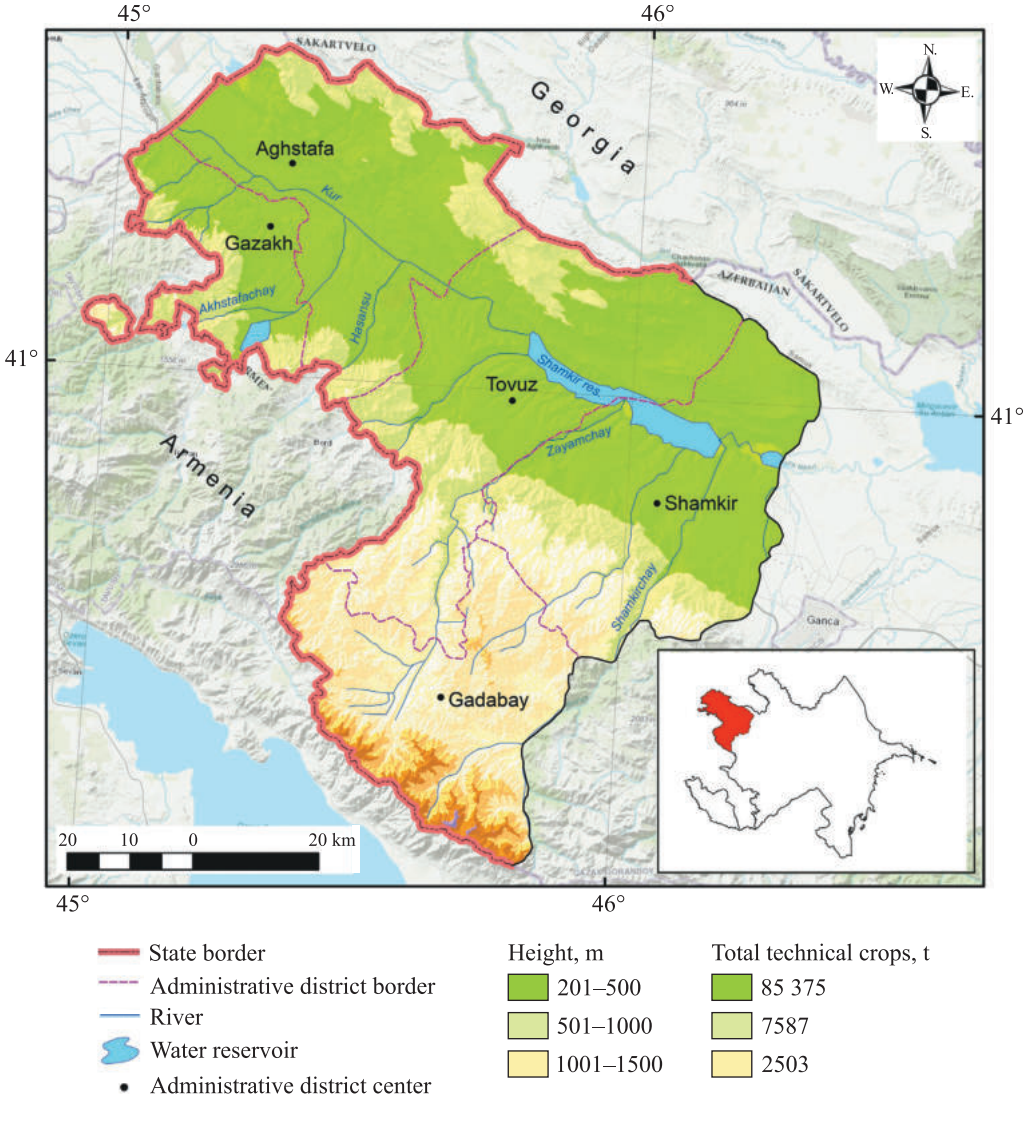

Fig. 4. Location of technical plants in the Gazakh-Tovuz economic region

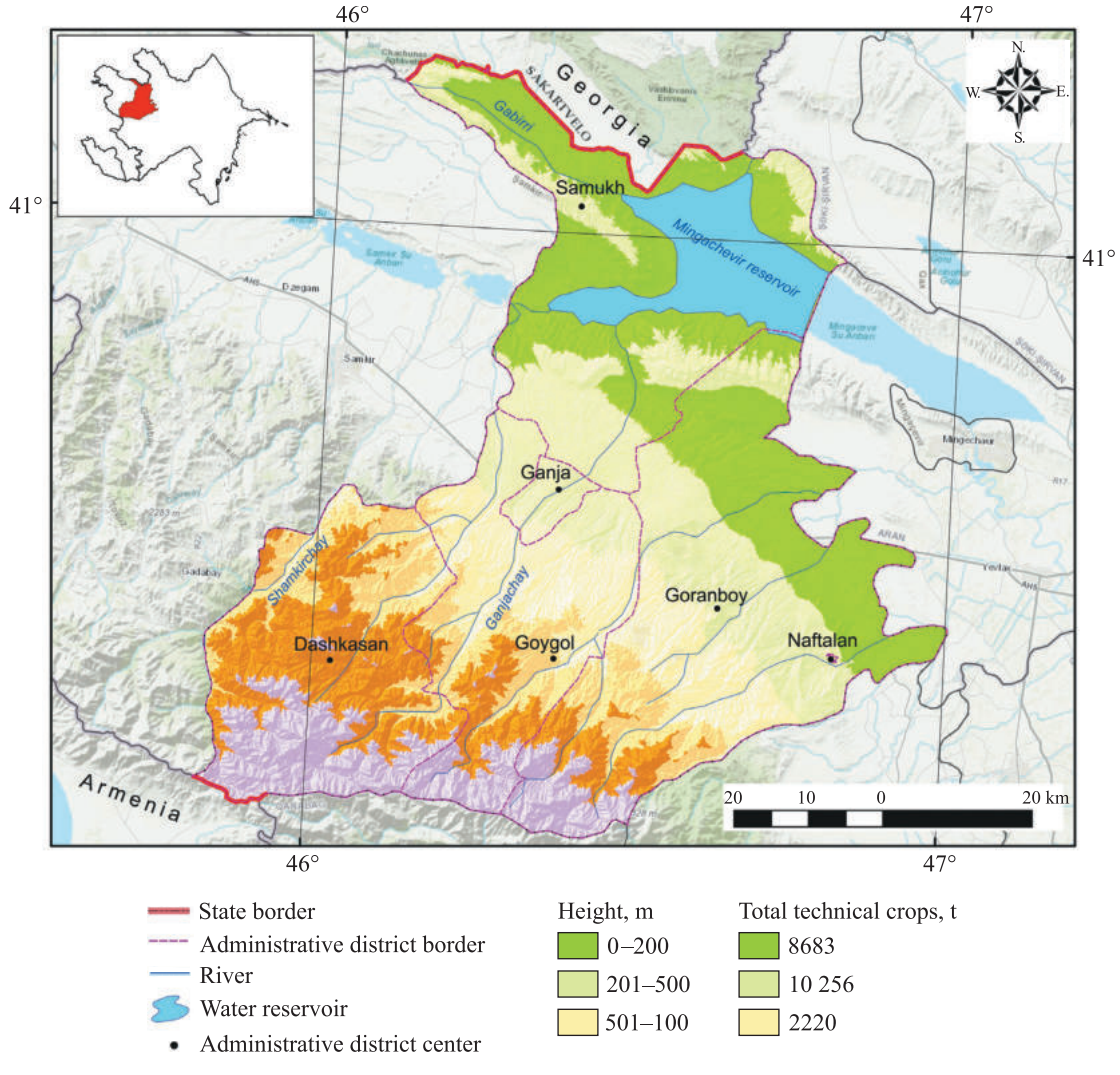

Fig. 5. Location of technical plants in the Ganja-Dashkasan economic region

Table 1

Total location and production of sunflower in the Ganja-Dashkasan and Gazakh-Tovuz economic regions by altitude zones in 2023

Altitude zones, m	Cultivated area		Production		Productivity, centner/ha
	Area, ha	Share, %	Volume, t	Share, %	
Ganja-Dashkasan economic region					
1–200	1231.2	30.9	4694.7	36.8	38.1
201–500	2362.7	59.3	7054.8	55.3	29.9
501–1000	390.5	9.8	1007.8	7.9	25.8
Total	*3984.4*	*100*	*12 757.3*	*100*	*31.3*
Gazakh-Tovuz economic region					
201–500	2255.6	94.4	5301.8	93.5	23.5
501–1000	105.1	4.4	289.2	5.1	27.5
1001–1500	28.7	1.2	79.4	1.4	27.7
Total	*2389.4*	*100*	*5670.4*	*100*	*26.2*

Note. Calculated on the basis of data from the statistical offices of the administrative districts of the Ganja-Dashkasan and Gazakh-Tovuz economic regions.

It should be noted that sunflowers need more water than other crops. Spring crops need at least four waterings. This can be reduced to three times if the weather is cool. However, the first and last waterings are very important. Productivity is low when water is scarce. If sunflower fields are irrigated as much as needed, their yield per hectare can increase by 100 %.

If farmers have good irrigation plants during the ripening period in sunflower growing areas, both the yield per hectare and the amount of oil in the pods increase significantly. At the end of some research, it was found that while the average yield in drought conditions is 1500–1600 kg/ha, 2750–3000 kg/ha can be obtained if the sunflower field is properly irrigated and 3500–4000 kg/ha if it is irrigated four times.

If we look at the location of the sunflowers, we can see that they are planted at an absolute altitude of 201–500 m. This zone has the lowest sunflower productivity in the north-western part of Azerbaijan (23.5 centner/ha). However, these rates vary from one district to another. After studying the differences between the administrative districts, it can be seen that the low productivity is linked to some problems in the administrative districts such as the failure to meet the demand for irrigation water, the lack of experience and expertise in horticulture and the poor organisation of maintenance.

At altitudes between 501–1000 m above sea level, 9.8 % of sunflowers are planted in the Ganja-Dashkasan economic region, and 4.4 % of sunflower are planted in the Gazakh-Tovuz economic region, accounting for 7.9 and 5.1 % of the total production. This zone has the lowest sunflower productivity (25.8 centner/ha in the Ganja-Dashkasan economic region) in the north-western part of Azerbaijan.

The last highland where sunflowers are grown is located at an absolute altitude of 1001–1500 m above sea level. This zone occupies only 1.2 % of the area of the Gazakh-Tovuz economic region. The share of this zone in sunflower production is 1.4 % of the total production of the Gazakh-Tovuz economic region. Productivity is 27.7 centner/ha.

One of the products exported by Azerbaijan is vegetable oils, more than half of which is sunflower (safflower) oil. As the country is competitive in the export of oils, it can reduce its dependence on imports by developing the horticultural sector[2].

Cotton is one of the most widely used crops for industrial and animal feed. The main cotton producing countries in the world are China, India, the USA, Brazil, Australia, Turkey, Pakistan, Uzbekistan and Egypt. These countries account for about 80 % of world production [18]. In fact, cotton accounts for almost half of the fibres used in the global textile industry. With an annual economic impact of 600 bln US dollars worldwide, cotton fibre is a well-known and leading in the textile industry [19]. Cotton fibre is mainly produced from cotton plants. In their wild form they are perennial woody shrubs and trees, but cultivated cotton is primarily an annual plant.

The cotton cocoons and seeds found in Mingachevir can be a good proof that this plant has been cultivated in our country since the 5–6th centuries. It is also known that in a number of cities of Azerbaijan, including Ganja and Shamkir, cotton fabrics were produced and exported[3].

Cotton has long been grown in the Samukh and Goranboy administrative districts of the Ganja-Dashkasan economic region. Thus, 19.9 % of the technical crops in the Ganja-Dashkasan economic region are cotton crops. The cotton plant has a high demand for light and heat. Although the solar radiation (2100–2400 h) is sufficient for the growth of cotton in the plain areas of the Ganja-Dashkasan economic region, due to the increasing cloudiness towards the middle highlands, the amount of radiation balance gradually decreases and the environment for the growth of the plant is created. Cotton can reach its potential productivity under dry seasonal conditions. In general, dry seasonal conditions and high temperatures last for a short period of time in the lowland areas of the Ganja-Dashkasan economic region, that prevents cotton from being fully productive [20].

The time from sowing to the onset of maturity is about 125–140 days for medium fibre varieties. For fine varieties, this period is about 145–160 days. The optimum temperature for good cotton growth and yield, including seed germination, is 25–30 °C. If the temperature falls below 25 °C, plant growth slows down. In the first stage of plant development, i. e. in the period before budding, raising the temperature to 30 °C accelerates cotton development, but if the daily temperature drops to 10–12 °C, the life processes in the plant stop. There is also a certain difference in the heat requirements of different varieties. While the seeds of some varieties germinate at a temperature of 7–8 °C, others require a temperature of 10–15 °C for germination [21].

In 2023, 1.5 thsd ha of cotton were grown in the Ganja-Dashkasan economic region, that is about 1.6 % of the total cotton area in the country. These plantations are located in the Goranboy district. Cotton is grown in two altitudinal zones in this region. More than four-fifths of the cotton area is located in the lowlands at an altitude of up to 200 m. Thus, 81.6 % (1.3 thsd ha) of the cotton area and 84.0 % of the production (3.5 thsd t) are concentrated in this zone, where the productivity is 28.2 centner/ha.

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[2]Strategic roadmap for the production and processing of agricultural products in the Republic of Azerbaijan [Electronic resource] : approv. by Decree of the President of the Repub. of Azerbaijan of 6 Dec. 2016 No. 1138 // Faolex / Food and Agriculture Organisation of the United Nations. Baku, 2016 (in Azerb.).

[3]Cotton // Ministry of Agriculture of the Republic of Azerbaijan : website. URL: https://www.agro.gov.az/az/bitkicilik/texniki-bitkiler (date of access: 15.12.2024).

The 201–500 m altitude zone is the second zone, where 18.4 % of the cotton area (0.3 thsd ha) and 16.0 % of the cotton production (0.7 thsd t) are concentrated. Productivity is 23.8 centner/ha.

In connection with cotton growing, there are cotton mills in the town of Delimammadli and a cotton factory in the town of Ganja, which play an important role in the development of light industry in the Ganja-Dashkasan economic region. Despite the fact that there are favourable conditions for the development of cotton growing in the plain areas of the economic region, the lack of water has led to a reduction in the crop in recent years. It should be noted that the effectiveness of all agrotechnical works carried out in cotton cultivation directly depends on the satisfaction of the plant's needs for moisture [3; 22].

One of the technical crops grown in the north-western part of Azerbaijan is sugar beet, which is a plant of the mild climate zone and is used both for sugar production and as a nutrient in cattle breeding. In the north-western part of Azerbaijan, 12.8 % of the technical crops are sugar beet. Despite the fact that there were opportunities to obtain 250–300 centner/ha, no attention was paid to the cultivation of this plant in our republic for a long time [23].

Sugar beet is a raw material for obtaining sugar. Thus, 40 % of the world sugar production comes from sugar beet [7].

World sugar production is about 160 mln t per year with per capita consumption of about 23 kg. Sugar beet yields better in temperate climates, particularly in areas such as France, Germany and the northern USA. After the first sugar beet plants produced sugar in the early 1800s, sugar from beets and cane completed the market [14]. The first and only sugar factory of Azerbaijan was commissioned in 2006 in the Imishli administrative district. The factory's daily sugar beet processing capacity has reached 10 000 t[4].

Since 2006, sugar beet cultivation has started in the Shamkir administrative district (110 ha) of the Gazakh-Tovuz economic region and in the Goranboy administrative district (47 ha) of the Ganja-Dashkasan economic region (fig. 6). Since 2012, there has been a growing interest in this area and the area under cultivation has been gradually expanded. Currently, more than a third of the country's sugar beet area (about half of its production) is located in the Gazakh-Tovuz economic region.

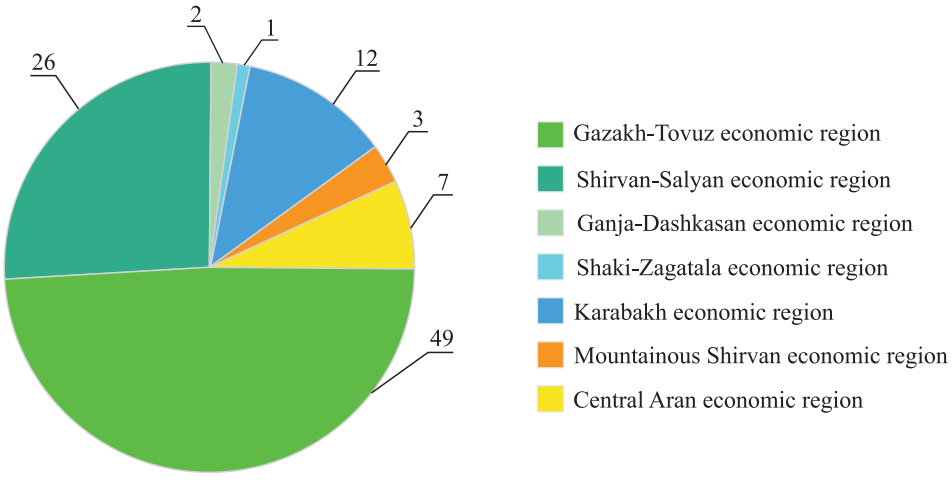

Fig. 6. Distribution of sugar beet production
in the Republic of Azerbaijan in 2023 by economic regions, %
(according to [9], modified)

The productivity of sugar beet is 621.5 centner/ha in the Samukh administrative district of the Ganja-Dashkasan economic region and 673.8 centner/ha in the Tovuz administrative district of the Gazakh-Tovuz economic region, which is higher than the overall productivity of the republic (446.2 centner/ha).

Sugar beet cultivation in upland areas covers four zones in the Ganja-Dashkasan and Gazakh-Tovuz economic regions (table 2).

In the Ganja-Dashkasan economic region, 17.9 % of the sugar beet area and 10.8 % of the production are concentrated in the lowlands with an absolute altitude of up to 200 m.

The highland areas with an absolute altitude of 201–500 m are the main sugar beet growing areas. Thus, 59.9 % of the sugar beet area (60.1 % of production) in the Ganja-Dashkasan economic region and 83.5 % of the sugar beet area (89.2 % of production) in the Gazakh-Tovuz economic region respectively are located in this altitude.

[4]State programme of socio-economic development of the regions of the Republic of Azerbaijan (2004–2008 years) / Minist. of Econ. and Industry of the Repub. of Azerbaijan. Baku : Minist. of Econ. and Industry of the Repub. of Azerbaijan, 2009. 204 p. (in Azerb.).

In the 501–1000 m, 22.2 % of the sugar beet area (29.1 % of production) in the Ganja-Dashkasan economic region and 12.6 % of the sugar beet area (8.1 % of production) in the Gazakh-Tovuz economic region are located.

In the Gazakh-Tovuz economic region, 3.9 % of the area under sugar beet and 2.7 % of production are concentrated between 1001–1500 m altitude.

Table 2

Total location and production of sugar beet in the Ganja-Dashkasan and Gazakh-Tovuz economic regions by altitude zones in 2023

Altitude zones, m	Cultivated area		Production	
	Area, ha	Share, %	Volume, t	Share, %
Ganja-Dashkasan economic region				
1–200	17.9	17.9	449.9	10.8
201–500	60.1	59.9	2503.6	60.1
501–1000	22.3	22.2	1212.3	29.1
Total	*100.3*	*100*	*4165.8*	*100*
Gazakh-Tovuz economic region				
201–500	1383.8	83.5	80 072.8	89.2
501–1000	208.8	12.6	7271.2	8.1
1001–1500	64.6	3.9	2423.7	2.7
Total	*1657.2*	*100*	*89 767.7*	*100*

Note. Calculated on the basis of data from the statistical offices of the administrative districts of the Ganja-Dashkasan and Gazakh-Tovuz economic regions.

There are favourable conditions for the cultivation of this economically efficient crop in the Ganja-Dashkasan and Gazakh-Tovuz economic regions. The development of horticulture can make a significant contribution to increasing production and satisfying the demand for sugar on the domestic market and in the domestic economy.

It should be noted that in the enterprise «Region Agropark», located on the territory of the Ganja-Dashkasan economic region, besides other agricultural crops, technical crops are also grown. In 2018–2019, 192 ha of cotton and 323 ha of sugar beet were planted in the enterprise «Region Agropark». Cotton production was 0.2 thsd t and sugar beet production was 6.7 thsd t.

Among the technical crops, tobacco is grown in small quantities in the region, accounting for about 1.8 % of the total tobacco crop in the country.

Tobacco originated in America. It is now grown in many countries around the world, particularly in China, India, Brazil, Indonesia and the USA. For tobacco seeds to swell and germinate, the environment must have the right level of humidity (not less than 80 %). The optimum temperature for seed germination is 25–28 °C. Under such temperature and humidity conditions, it takes 1 day for the seed to swell and 2–3 days for the sprouts to appear on the soil surface. The minimum temperature for colouring is 10–11 °C, the optimum conditions for the ripening phase of the plant are 23–28 °C of the average daily air temperature and the maximum temperature is 35 °C. If the temperature drops to –2…+3 °C, frost will destroy the tobacco plant during the growing season. Tobacco is a relatively drought tolerant crop.

Tobacco plantations account for 0.4 % of technical crops in the north-western part of Azerbaijan. Tobacco is labour intensive and less profitable than other agricultural crops. It should be noted that 54 % of the total population of this area lives in rural areas. Therefore, agriculture is an important part of the population's employment in the economic sectors. In this respect, the development of tobacco growing is of great importance for the north-western part of Azerbaijan [2].

In 2023, a total of 0.8 % of the country's tobacco was produced in the north-western part of Azerbaijan, with a productivity of 29.8 centner/ha in the Gazakh-Tovuz economic region, which is higher than the total productivity of the republic (23.1 centner/ha).

In total, 63 ha of tobacco were grown in the north-western part of Azerbaijan producing 49.9 t of crop. Of this, 55 ha of tobacco were grown in the Tovuz administrative district of the Gazakh-Tovuz economic region producing 26.1 t of this crop and 8 ha of tobacco were grown in the Goranboy administrative district of the Ganja-Dashkasan economic region producing 23.8 t of this crop. Tobacco is mainly grown at altitudes between 201–500 m.

The development of technical crops by altitude zones creates conditions for the effective use of soil-climatic resources and the increase of employment of the population, including the development of processing institutions. It also stimulates the development of entrepreneurship in the north-western part of Azerbaijan.

It should be noted that, as in other areas of horticulture, there are some difficulties in growing technical crops. In particular, lack of irrigation water, inappropriate irrigation, infrequent use of the intercropping system and lack of control of plant pests and diseases reduce productivity. Agrotechnical measures need to be applied in a timely and appropriate manner to increase productivity.

Conclusions

The study of the cultivation and production of technical crops and the organisation of altitude zones in the Ganja-Dashkasan and Gazakh-Tovuz economic regions shows that there are plenty of opportunities for sufficient development of this sector in the north-western part of Azerbaijan. The analysis of the location and modern condition of technical crops in the Ganja-Dashkasan and Gazakh-Tovuz economic regions shows that in the last 10 years attention has been paid to the cultivation of technical crops on the territory of the north-western part of Azerbaijan and their production has increased. In particular, this region has become the main producer of sunflower and sugar beet in the country. Thus, in 2023, more than two-fifths of the country's sugar beet production fell to the Gazakh-Tovuz economic region, and almost two-thirds of the country's grain sunflower production fell to the Ganja-Dashkasan economic region. The main altitude zone where technical crops are grown and produced is between 201–500 m absolute altitude. Only 81.6 % of cotton plantations and 84.0 % of production are concentrated on plains with an absolute altitude of up to 200 m. This is due to the favourable natural conditions for growing this crop at these altitudes. In the Gazakh-Tovuz and Ganja-Dashkasan economic regions, it is possible to solve problems in the field of technical horticulture and achieve high productivity by correct use of natural and economic factors. In these economic regions, it is appropriate to pay attention to all areas of technical crops to use productive varieties and to apply progressive achievements in this field.

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